Albuquerque Public Schools
STEM Trajectory Initiative and CubeSAT Project

Presented By:
Alma Ripley, Assistant Principal
Albuquerque Public Schools, Albuquerque, NM
ripley_a@APS.edu

(505) 410-2107

Overview of Today's Session

1. What does STEM Trajectory Initiative (STI) mean?
2. Why did we need to come up with STI ?
3. Has it worked?
4. Why are we here today?

STEM Trajectory Initiative Is:

- Four years of changing students' minds about their ability to be scientists, technicians, engineers, and mathematicians.
- Four years of influencing a shift in teacher's mind-set as they demonstrate excellence, commitment, and go over-and-beyond their "job description", day-after-day, to deliver project-based learning opportunities through STI.
- Teaching students the bridges between language, writing and STEM.
- Showing students that they can reach the International Space Station, and explore the outer edges of the atmosphere.

ARISS Contact 2016

Strategy for 21st Century Learning
STEM Trajectory Initiative

- STEM Trajectory Initiative (STI) was launched in 2013
- STI is a non-traditional approach to the "delivery of instruction" using Project Based, hands-on, real-world concepts to insure student success through application learning
- Students see projects as the overarching framework through which they can address academic content and ideas
- Connect other important personal development goals for students, such as social and organizational skills, leadership styles, collaboration methods, time and project management, etc.
- Use Amateur Radio to provide a consistent foundation, gluing major project phases together

Skills identified as critical for the 21st Century workforce

- Ethics
- Entrepreneurial skills
- Professionalism
- Critical thinking
- Creativity
- Global awareness
- Oral/written communications
- Technology use
- Collaboration/teamwork
- Adaptability
- Problem solving
- responsibility

It is more than just technology

21st Century Skills are not new

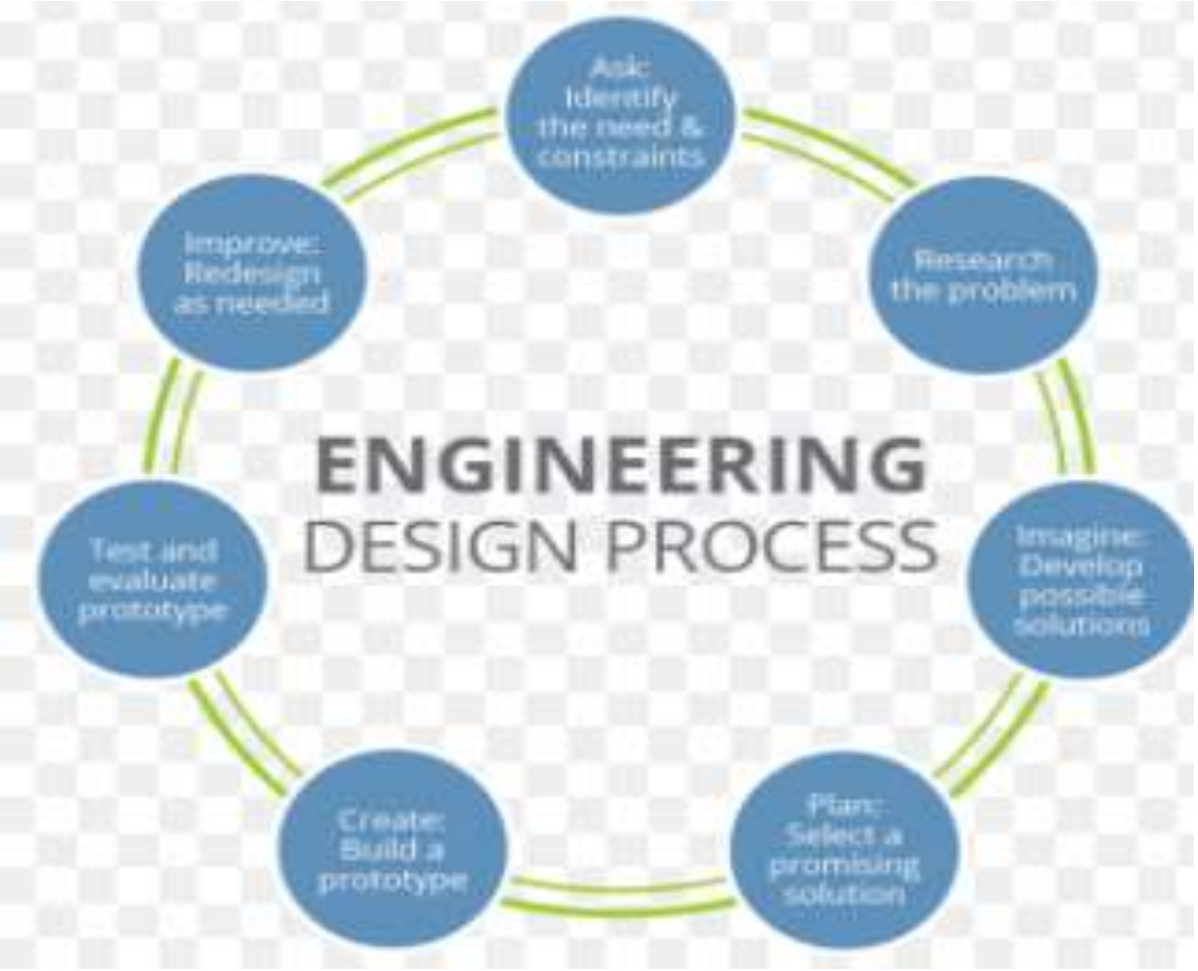
- What is new is the extent to which individual and collective success now depends on all students to have such skills.
- Academia has underestimated the magnitude of the challenge to teach these skills with meaningful content.
- Going forward in the 21st century, major changes are necessary in curriculum, teacher training and assessment.

“Engineering The Future” MAGNET STEM K-12 Pathway

US Department of Education has given Albuquerque Public Schools $7.8 Million over the next 5 years to continue building a “K-12 STEM Magnet School Pathway” within the Valley High School “cluster”, which includes select feeder schools.

- Valley HS is the **Vanguard** of STEM in Albuquerque
  - High Altitude Balloon Missions
  - Robotics
  - Rocketry
  - **ARISS Direct Contact**
  - **CubeSAT Project & Dual Credit Electronics Course**

STI Implementation Follows Engineering Design Processes



Real World Education

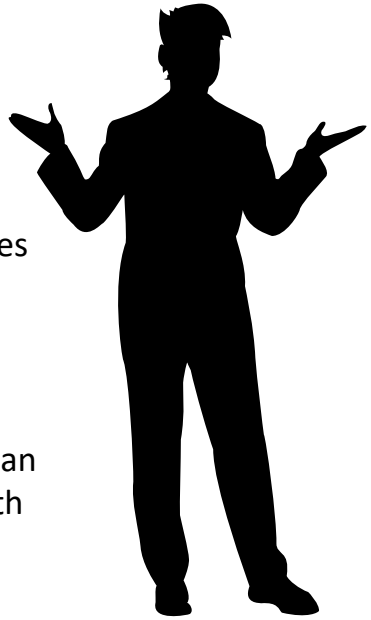
Successes & "Failures"

Find a Way to Use Amateur Radio in Schools

Ready to serve as “Elmer” for school

Can often provide resources

Provide information that can show hobby alignment with standards



Trained, educated technologist

Often background checked and cleared

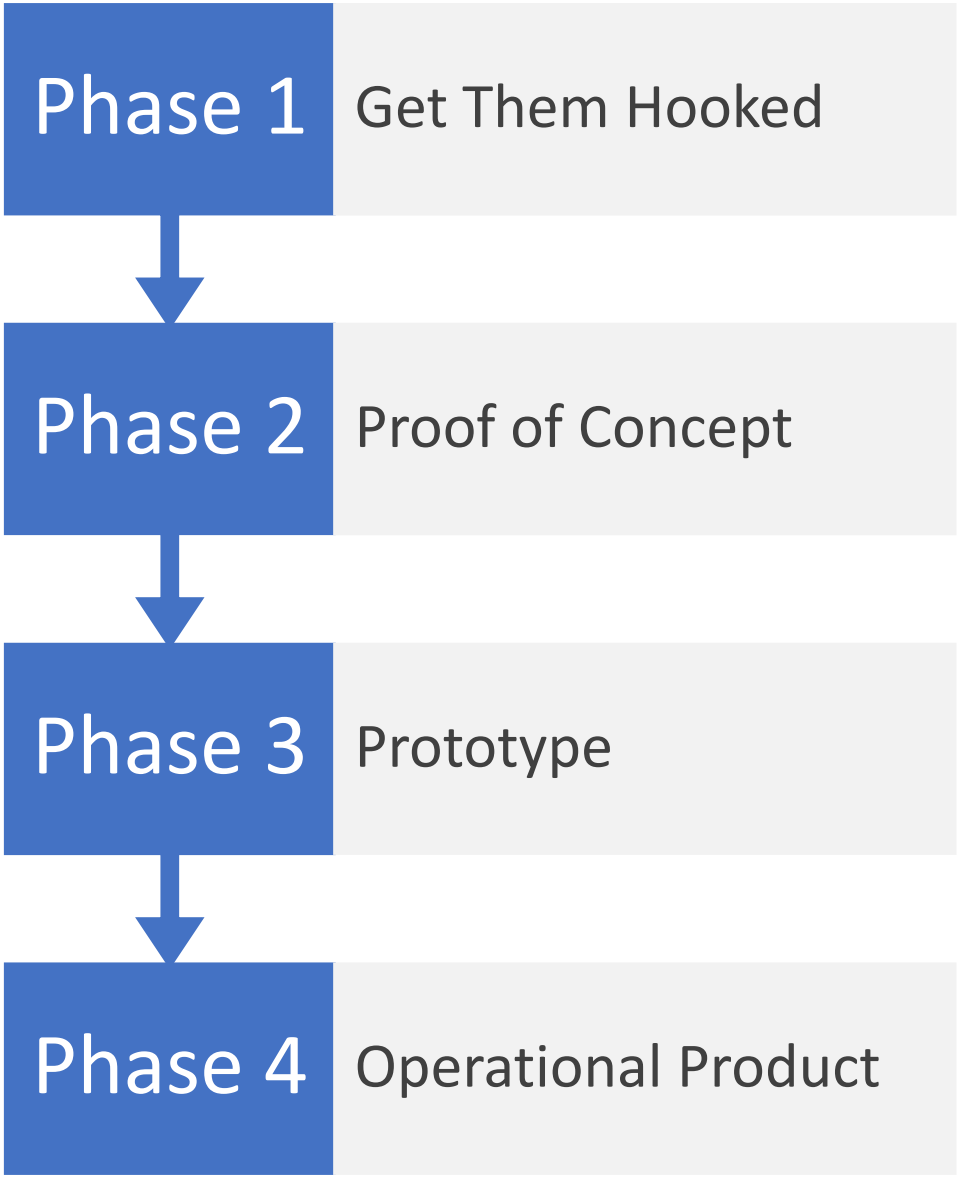
The CubeSAT Program Initiative

- Kicked off 3-4 year effort to design, build, test, prepare for launch, launch, and operate an operational CubeSAT
- Student Involvement
  - Current APS High School Students
  - Future APS High School Students
  - APS Graduates which have entered universities, pursuing various STEM related degrees.
- Involves Industry Mentors and the Amateur Radio Community, including…..
  - Sandia National Labs
  - Air Force Research Labs
  - Modern Apprentice
  - Albuquerque Area Amateur Radio Groups
  - APS Education Foundation

The CubeSAT Program Student Related Goals

- Mastery of 21st Century satellite technology using Project Based Learning.
- Define an achievable project to specify, design, implement, test and execute the construction of an actual CubeSAT.
- Plan a long-range project – utilizing Project Management skills for planning purposes.
- Develop practical and technical engineering skills
- Be exposed to top colleges and universities expressing interest in partnering with us on this multi-year project.
- Opportunities for civic engagement.
- Opportunity to “plan my future”.

STI Phased Approach For CubeSAT Project



So What Was Phase 1?

- Rocketry & Robotics
- Near Space HAB Missions
  - Payload development and innovation
  - Getting students curious and hooked on STEM
  - Evolved to build payloads that looked and felt like CubeSATs (before they knew what a CubeSAT was)
- **Phase 1 connected 24 APS schools together**, in addition to partnering with 12 other schools from around New Mexico and Colorado.

STI Moved Into Phase 2 Summer 2017

- Dual Credit Course – High School Elective + College Beginning Electronics
  - FCC Amateur Radio Technician Class license woven into electronics curriculum
  - Project Management
  - Space Sciences, Geometry, Physics
  - Engineering Notebooks, Presentations, Storyboards, etc.
  - Leadership and Team Participation
  - 50% Applied Learning, 50% Theory
  - 3 Weeks, 5 Days/Week, 10 Hours/Day ---- and all the students loved it !!
  - Each student had a customized learning plan
  - Taught and supported by APS teachers, administrators, hams & industry mentors
- Participated in Field Day Weekend for hands-on Ham Radio Education

Summer Course 2017 Facts

- Designed to achieve specific objectives dictated by
  - High School elective credit
  - Aligned with Standards
    - Common Core
    - Next Gen Science Standards
    - Project Leads the Way
  - College (CNM) approved syllabus for “FCC License Prep & Satellites”
- Worked because all essential elements were approached as components of an identifiable project
  - **Project Based Learning**
- One Class (First Year) Only

Summer Course 2018 Thoughts

- Same Idea and Format as 2017
- 2 Classes
  - Beginning Students (Theory, Practice, Tech License)
  - Return Students (More Theory, Integration, Testing, General License)

- Beginning Students will do more-or-less what was done in 2017, but with lessons learned applied
- Return Students will graduate to 2nd year class, and pick up where 1st year left off
  - Environmental Qualification Testing
  - Understanding the Rigors of Space
  - Transition Proof of Concept to Prototype
  - Beginning to Test Prototype Systems Designed and Built during SY 2017-2018

Thank You

For Further Information, Please Contact

Alma Ripley

Ripley_A@aps.edu

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Carlos Rey STEM Day, 2015